

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR PATENT

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TITLE: Interactive Personal Narrative Agent System and
Method

ATTY DOCKET: RTD-120

Priority

This application claims the benefit of priority to United States provisional patent application no. 60/202,882, filed May 10, 2000.

Background of the Invention

1. Field of the Invention

The invention relates to customized story experience creation and evolution, and particularly to interactive narrative utilizing a narrative agent for automatic management of personalized stories in a single or multi-player virtual environment.

2. Discussion of the Related Art

At least three general approaches to providing interactive narrative are prevalent in the art. According to a first approach espoused by the Oz group under the direction of Joseph Bates at Carnegie Mellon University, a user is allowed to make choices within the confines of a narrative presence directed by a centralized drama manager. That is, the drama manager of the Bates system directs the story from a centralized position assuming comprehensive knowledge and narrative control of all interactions in the system. According to a second approach, stories are generated from simulations of narratively causal interactions, such as is described by Chris Crawford, citation below. According to a third

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approach, plot graphs or nodal architectures are utilized. These systems have a limited number of predetermined story possibilities depending on how the user chooses to traverse the nodal architecture.

FIG.1 is illustrative of the Bates system, and the first approach, and is excerpted from "Dramatic Presence", Margaret Thomas Kelso, Peter Weyhrauch and Joseph Bates, submitted to PRESENCE, and published online. The "physical world" shown in FIG. 1 is an observable environment within which a story takes place. The interactor is a user who makes choices while interacting with other characters in the physical world. The "characters" are completely computer generated and controlled objects. A centralized "drama manager" directs the actions of the characters and other objects within the physical world and communicates with the interactor through an interface using a "theory of presentation". By doing so, the drama manager attempts to guide the interactor through a predetermined narrative, while allowing the interactor to interact freely with the characters and the physical world.

FIG. 2 is illustrative of the simulation approach, or second approach, and is taken from U.S. patent no. 5,805,784 to Crawford. Each oval shown in FIG. 2 represents a sub-story ("SS"). A user may experience a story consisting of several sub-stories. The story is experienced as each sub-story links narratively to possible subsequent sub-stories. The interactions form a simulation of narrative possibilities, allowing the user to direct the story interactively by making selections. The overall story depends on which sub-stories are presented based on the user's actions. In this way, the story is constructed piecewise from locally connected sub-stories, as the simulation progresses.

The system described in the '784 patent does not have the concept of a larger story arc (or arcs) with which to shape a specific narrative experience. As a result, the user's overall experience may or may not include traditional narrative stages such as climax or denouement. The system described by Crawford in the '784 patent simulates a local

narrative causality, but is unable to shape entire stories with traditional narrative effect.

FIG. 3 is illustrative of a nodal architecture approach, or the third approach, and is taken from Kelso, *supra*, at p. 5, although the approach is widely known in the art. The overall story depends on which nodes along the architecture are traversed according to selection by the user. The system is interactive since the user typically influences the story by making choices or taking actions at each node in the graph. The system is narrative in the sense that the sum and ordering of the nodes traversed is predetermined in defining story possibilities. The system is restrictive in the sense that the user follows one path of a limited predetermined set of possible paths and interaction is limited to the specific actions allowed at each node as the narrative progresses.

Each of the above conventional approaches is limited in that the user may only contemporaneously experience a single story to its narrative conclusion. In addition, none of those approaches scales well to a system involving a large number of simultaneous users interacting in a shared space.

Summary of the Invention

In a first aspect of the invention, a software application enables a personal narrative agent (PNA) to create and manage multiple dynamic customized story experiences for a subject user in a user-observable environment having one or more objects with which the subject user may interact. The PNA selectively interacts with one or more of those objects to manipulate the environment in furtherance of the story experiences. The PNA further maintains data relating to the subject user, the environment and the multiple story experiences of the subject user. The PNA also simultaneously manages each of the story experiences each of which reaches its own narrative conclusion consistent with input and characteristics of the subject user and any objects selected to influence the story experiences.

In a second aspect of the invention, a software application enables a PNA to create and manage one or more dynamic customized story experiences for each of multiple users wherein a unique PNA is assigned to assist each user throughout the story experiences of the user in a user-observable environment having one or more objects with which the users may interact. A first and a second PNA which are respectively assigned to a first and a second users selectively interact with the objects to manipulate the environment in furtherance of the story experiences, including independently managing different story opportunities for the first and second users, respectively, consistent with the story experiences of the first user and the second user. The PNAs of the first and second user maintain data relating to the first and second users, respectively, and the one or more story experiences of the first and second users, and of the environment. The PNAs of the first and second users also manage each of the story experiences of the first and second users, respectively, to its own narrative conclusion consistent with input and characteristics of the first and second users and any objects selected to influence the story experiences, such as to enable each of the first and second users to pursue individual stories independent from the stories of the other user.

According to a third aspect of the invention, a software application enables multiple PNAs to create and manage one or more dynamic customized story experiences for multiple respective users, wherein a unique personal narrative agent is assigned to assist each user throughout the story experiences of the user in a user-observable environment having one or more objects with which the users may interact. The PNA of a first user selectively interacts with one or more of those objects and a second PNA which is assigned to a second user to manipulate the environment in furtherance of the story experiences of the first user, including negotiating a story opportunity involving the second user for the first user with the second PNA consistent with the story experiences of the first user and one or more story experiences of the second user. The first PNA also maintains data relating to the first user, the second user,

the one of more story experiences of the first user, and the environment. The PNA of the first user further manages the story experiences of the first user to a narrative conclusion consistent with input and characteristics of the first user and any objects selected to influence the story experiences.

In a fourth aspect of the invention, a software application enables a PNA to generate a story for a user according to a first narrative form. The PNA then determines or identifies events tending to cause the story to be inconsistent with the first narrative form. Then, the PNA transforms the story to an instance of a second narrative form for which the events are consistent.

In a fifth aspect of the invention, a software application includes a story selector component for selecting stories for a user. The story selector analyzes the user's actions in a storyenvironment, and determines which stories from a set of known stories contain similar actions. The story selector then creates a plan for the future continuation of the user's story.

According to a sixth aspect of the invention, a software application enables multiple PNAs to create and manage one or more dynamic customized story experiences for multiple respective users, wherein a unique personal narrative agent is assigned to assist each user throughout the story experiences of the user in a user-observable environment having one or more objects with which the users may interact. The PNA of a first user selectively interacts with one or more of those objects and a second PNA which is assigned to a second user to manipulate the environment in furtherance of the story experiences of the first user, including negotiating with the second PNA for the use of one or more objects which, depending on the negotiation, may be used in one or both of the first and second users' stories. The first PNA also maintains data relating to the first user, the one or more objects subject to the negotiation, the one of more story experiences of the first user, and the environment. The PNA of the first user further manages the story

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experiences of the first user to a narrative conclusion consistent with input and characteristics of the first user and any objects selected to influence the story experiences, including any objects determined from the negotiation to influence the story experiences.

In a seventh aspect of the invention, a business method is set forth wherein a software application enables a personal narrative agent (PNA) to create and manage one or more dynamic customized story experiences for a subject user in a user-observable environment having one or more objects with which the subject user may interact. The PNA selectively interacts with one or more of those objects to manipulate the environment in furtherance of the story experiences. Each object interaction is associated with a value that the PNA and/or subject user is prompted to agree to prior to use of that object being enabled for interaction. There may be a negotiation involving the subject user and/or the PNA for determining the value of an object.

In addition, a negotiation may occur between the PNA of the subject user and a second PNA associated with a second user for the use of one or more objects that are the subject of contention between the respective PNAs. The negotiation may involve bidding or auctioning of the contended-for objects to determine the value of the objects with respect to object interaction in a story experience of either or both of the subject and second users. The negotiation may include input from either or both of the subject and second users. Depending on the outcome of the negotiation, an object may be used in one or both of the first and second users' stories.

According to the seventh aspect of the invention, the first PNA also preferably maintains data relating to the subject user, the one or more objects subject to the negotiation, the one or more story experiences of the subject user, and the environment. The PNA of the first user further preferably manages the one or more story experiences of the subject user to a narrative conclusion consistent with input and characteristics of the subject user and any objects selected to influence the story experiences,

including any objects determined from the negotiation to influence the story experiences.

Brief Description of the Drawings

FIG.1 schematically illustrates the Bates system of interactive narrative.

FIG. 2 schematically illustrates the simulation approach to interactive narrative.

FIG. 3 schematically illustrates a nodal architecture approach to interactive narrative.

FIG. 4a schematically illustrates a user involved in multiple contemporaneous story experiences in accord with a preferred embodiment.

FIG. 4b illustrates multiple contemporaneous story experiences of a user in accord with a preferred embodiment

FIG. 5 schematically illustrates multiple users each having a uniquely assigned PNA for creating and managing their story experiences in accord with a preferred embodiment.

FIG. 6a schematically illustrates negotiation of a story experience by a PNA uniquely assigned to one user for its associated user with another PNA uniquely assigned to another user in accord with a preferred embodiment.

FIG. 6b schematically illustrates narrative agent scopes of interest in accord with a preferred embodiment.

FIG. 7a schematically illustrates a network diagram in accord with a preferred embodiment.

FIG. 7b schematically illustrates a network diagram including a server farm in accord with a preferred embodiment.

FIG. 8 schematically illustrates server management of a virtual world in accord with a preferred embodiment.

FIGS. 9a-9c schematically illustrate single user and multi-user embodiments.

FIG. 10 illustrates narrative agent querying and modification of world state in accord with a preferred embodiment.

FIG. 11 illustrates narrative personalization for each user in accord with a preferred embodiment. FIG. 12 illustrates management of scenes and a narrative agent state machine in accord with a preferred embodiment.

FIG. 13 illustrates narrative agent determination of a successive scene in accord with a preferred embodiment.

FIG. 14 illustrates narrative agent setup of a successive scene in accord with a preferred embodiment.

FIG. 15 illustrates narrative agent transition between successive scenes in accord with a preferred embodiment.

FIG. 16 illustrates narrative agent evolution of a current scene in accord with a preferred embodiment.

FIG. 17 illustrates narrative agent generation of a proposed story in accord with a preferred embodiment.

FIG. 18 illustrates a timeline for scene transition in accord with a preferred embodiment.

FIG. 19 illustrates an anatomy of a narrative form in accord with a preferred embodiment.

FIG. 20 illustrates story evolution and state machine in accord with a preferred embodiment.

FIG. 21 illustrates relationships among narrative forms in accord with a preferred embodiment.

FIG. 22 illustrates sharing of stories by multiple players in accord with a preferred embodiment.

Incorporation by Reference

What follows is a cite list of references each of which is, in addition to the reference cited in the priority section, hereby incorporated by reference into the detailed description of the preferred embodiments below, as disclosing alternative embodiments of elements or features of

J. Bates et al., An Architecture for Action, Emotion, and Social Behavior May 1992;

Literary choice, 182 PCW, December 1986;

C.S. Pinhanez et al., Interval Scripts: a Design Paradigm for Story-Based Interactive Systems CHI 97 Electronic Publications: Papers;

United States patents No. 5,604,855, 5,727,950, 5,873,057,
5,692,212, 5,805,784, 6,045,447, 5,807,173, 5,657,462, 5,990,880,
5,100,154;

PCT Publications No. WO 97/12350, WO 97/44766, WO 97/44767, WO 95/14268, WO 00/14648, WO 98/06044, WO 99/08205, WO 85/01601, WO 92/05479, WO 93/21586, WO 96/37815, WO 99/63450, WO 99/36863, WO 98/47086; and

European Patent Office publications no. O 159 345, O 270 457, O 360 423 B1.

Detailed Description of the Preferred Embodiments

FIG. 4a schematically illustrates a user involved in multiple contemporaneous story experiences or stories in accord with a preferred embodiment. As set forth herein, a story shall include, but not be limited to, any event, expression, presentation or perception or sequence of events, expressions, presentations or perceptions, such as could be recounted by an observer thereof or participant therein. A story may involve tragedy, history, comedy, improvisation, drama, documentary, games, sports or the like.

FIG. 4a illustrates an object agent labeled object agent 1, which is Lisa's personal narrative agent OA1 or a personal narrative agent (hereinafter "PNA") uniquely assigned to a user named Lisa, managing each of eight stories for Lisa labeled Story 1 through Story 8. Lisa's PNA OA1 is preferably generated within a computer system as instructed by system programming in accordance with input from Lisa and other system parameters. Each of Stories 1-8 is typically based on a narrative form from a narrative form library 4 available within a computer system memory and/or within its programming. For example, Stories 1 and 4 are each based on narrative form A, Stories 2 and 8 are each based on narrative form B, Story 5 is based on narrative form C and Stories 3 and 6-7 are each based on narrative form D. The narrative form library 4 may contain many more narrative forms than the four narrative forms A-D shown in FIG. 4a, and Lisa may be involved in any number of contemporaneous stories more or less than 8. Moreover, each of Stories

1-8 may be transformed into a new story based on a different narrative form, or may progress in its present narrative form, or may terminate or be abandoned prior to reaching a narrative conclusion, as set forth in more detail below with reference to FIG. 20.

The system according to FIG. 4a allows a user to be involved in more than one contemporaneous story experience or story that may be played out to a narrative conclusion. At any particular time, Lisa's PNA OA1 may manage multiple stories or stories for Lisa. Each story is an instantiation of a narrative form, e.g., as contained in the narrative form library 4, and a given narrative form may create multiple unique stories. Lisa's PNA OA1 determines which story sets the current scene for Lisa (e.g., which is the primary story), and manages transitions of the primary status among stories, as set forth in more detail below with reference to FIGS. 12-16. Lisa's PNA OA1 also may weave the various stories together in Lisa's experience. Since it drives the actions for each scene, Lisa's PNA OA1 can pull scene elements from other active stories, as well as from other sources. It is noted here that the same discussion above and below with respect to Lisa and Lisa's PNA OA1 relates also to the experiences of any other users and their uniquely assigned PNAs (not shown in FIG. 4a, but see, e.g., FIGS. 5-6).

As shown in the illustration of FIG. 4a, Lisa's PNA OA1 manages each of Stories 1-8, simultaneously. Lisa's PNA OA1 influences the progression of each story based on "belief" data including data relating to characters, objects and activities within the environment and Lisa's interests. The characters, objects and activities may combine computer-generated and/or user-generated inputs. Any single activity involving Lisa, such as an interaction with another character or other object in the environment, may serve to progress any number or none of the stories or stories. Lisa's PNA OA1 continuously updates the belief data including data relating to input from Lisa and interactions and activities of characters and objects in the environment. Lisa's PNA OA1 furthers the narrative progression of each story by generating and presenting

interactive opportunities that Lisa may or may not choose to pursue. For example, Lisa's PNA OA1 manages transitions between stories seamlessly such that Lisa is never confined to pursuit of an isolated story experience.

Personal narrative software architecture in accord with preferred embodiments of the invention enables users to experience multiple stories simultaneously as referred to with respect to FIG. 4a. Each story could be finished at one continuous sitting, or could be experienced asynchronously. The diagram shown in FIG. 4b illustrates this feature by providing an example of a user's narrative experience. Each arc represents a specific story and the numbers 1-23 represent a time index. Some stories are completed and others can be abandoned as illustrated by dashed lines in FIG. 4b. Some stories have a genesis independent of other stories, e.g., stories A1, A2 and A3 beginning at time points 8, 1 and 15, respectively. Others can be derived from previous stories, e.g., story A4 from story A2 at time point 2 and story A5 from story A3 at time point 16.

FIG. 4b also shows how a single scene at a single point in time, e.g., time point 14, can contribute to more than one story, e.g., as represented by story arcs A6, A7 and A8. The PNA accomplishes this by weaving the stories together. Any scene might have elements and cause value transitions for two or more stories simultaneously and advantageously in accord with a preferred embodiment.

Fig. 5 schematically illustrates multiple users each having a uniquely assigned PNA for creating and managing story experiences in accord with a preferred embodiment. The example shown at FIG. 5 includes three users, Lisa, Mike and Fred each connected to a virtual world simulation 6 via the internet or a local or wide area network (LAN or WAN, see FIGS. 7a-7b and 9a-9c, and discussion thereof, below). The virtual world simulation represents a preferred story environment, whereas the story environment may be simulated or may alternatively be real. For example, the story environment may be a virtual world as generated by a computer-user interface, or may be a setting involving real persons as

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Each user receives his or her own uniquely assigned PNA. In accord with a preferred embodiment, the player's representation in the virtual world simulation 6 is instantiated as a player object, e.g., player objects O1, O2 and O3 represent Lisa, Mike and Fred, respectively. The player objects O1-O3 mediate communication and manage player state and game, tutorial, educational or event logic. The PNA of each player, e.g., agents OA1, OA2 and OA3 of Lisa, Mike and Fred, respectively, manipulate objects, e.g., objects O4, O5 and O6 shown in the virtual world 6 of FIG. 5, and presentations of those objects O4, O5, O6 to the user.

Thus, the system according to FIG. 5 allows multiple users each having a unique PNA working to progress one or more stories or stories involving that user, wherein each user may pursue individual interactive stories, whether or not the user chooses to involve any particular other user. The PNAs of each of the multiple users, e.g., Lisa, Mike and Fred interact with or influence objects in a common real or simulated environment, i.e., the virtual world simulation 6. The PNAs may also interact with each other to negotiate narrative progressions for their respective users that may involve other players. For example, Lisa may play a role in Mike's story and/or vice-versa, and the scene may be pre-arranged by negotiation between the PNAs of Lisa and Mike.

FIG. 6a illustrates negotiation of story experiences by PNAs uniquely assigned to users with other PNAs uniquely assigned to other users in accord with a preferred embodiment. FIG. 6a illustrates a virtual world simulation 6 with which four users, Lisa, Mike, Fred and Sally are connected over a network. The just-named users are represented in the virtual world 6 by user objects O1-O4, respectively, and each player has a uniquely assigned PNA represented by agent objects OA1-OA4, also respectively.

The roles that the other users such as Lisa, Fred and Sally play in Mike's story can be small parts limited to one or a few scenes, or these other users can share entire stories designed for two or more users. At an extreme, the PNA of one user may negotiate with thousands of other PNAs to bring the user into a wide-ranging story. For example, the PNA of a general in a story might recruit two entire armies made up of users and their uniquely assigned PNAs, and characters and objects in the virtual world. Such widespread negotiations may also utilize distributed, hierarchical networks of PNAs, such that each PNA negotiates with a limited number of other PNAs. Continuing the above example, the PNA of the general may negotiate with PNAs of staff officers which negotiate with PNAs of lower ranking officers, which negotiate with PNAs of staff sergeants, which negotiate with PNAs of lower ranking enlisted personnel, etc. In this way, enlisted personnel characters may participate in the story of a user playing a general, such as in a game or educational scenario, and may be subject to the broad orders of the general, while their associated PNAs never negotiate directly with the general's PNA, simulating a military hierarchy of command.

FIG. 6b schematically illustrates the scopes of interest of PNAs. Each PNA can limit its awareness of the objects in the environment to those objects that are relevant to its user's stories. For example, Lisa's PNA OA1 maintains awareness and a scope of interest SI1 that includes

Similarly, Mike's PNA OA2 has a scope of interest SI2 that includes O2, O4-O6, O15-O17, and OA1, and thus partially overlaps with SI1. Lisa's and Mike's narrative agents OA1 and OA2 can negotiate with one another for story opportunities for their respective users, as illustrated by B1. Similarly, the PNAs OA1 and OA2 share an interest in objects O15-O17 and can negotiate for their use Lisa's and Mike's stories, as illustrated by connections B7 and B8 to object O15. A PNA's scope of interest need not overlap with other PNAs', as illustrated by Sally's PNA's scope of interest SI3. In accord with a preferred embodiment, many objects in the world might not be in any PNA's scope of interest, as illustrated by O21-O23.

A first user U1 is shown connected to the server 8 in the exemplary network diagram of FIG. 7a, in accord with a preferred embodiment. A connection is made to the internet. Several other users may be connected to the server via the internet, in this example, such as

Referring now to FIG. 7b, a server complex such as was referred to with respect to Fig. 7a is schematically shown. The system shown is connected to the internet. An object/load manager server S1 is also shown connected to the network. The object/load manager server S1 preferably performs the function of managing user connections and receiving and distributing data relevant to user's dramatic stories, such as data relating to user movements and actions, nearby users, automated objects controlled by the object/load manager server or another server, audio, video and/or data files, or other such related data. A login manager server S2 is also shown connected to the network. The login manager server S2 preferably performs the function of managing authentication, security and integrity for each user connection.

A server farm 12 is also shown including multiple additional servers S3-S6. Many more than four such servers may be included in the server farm 12 which could be a vast network connecting users on a very large scale, or could be limited to a single server or a few servers and a localized or wide area network. Each server S3-S6 in the server farm 12 is shown connected to a datastore D3-D6, respectively, which contain information such as relates to current states of objects O8-O11, respectively, for allowing one or more users to interact within an environment, such as a virtual world, according to the preferred embodiments. Each server S3-S6 preferably manages objects in the virtual world O8-O11, respectively, within which users connected thereto are interacting and experiencing interactive stories.

The virtual world 6 of FIG. 8, which the server application SA manages, includes Lisa's narrative agent OA1 and Mike's narrative agent OA2 and player objects for Lisa and Mike, O1 and O2 respectively. Object characters Rosencranz and Guildenstern are computer-controlled characters also immersed in the virtual world 6. These characters might or might not be utilized as object characters in a story of Lisa and/or Mike, perhaps upon negotiation between the the computer-controlled characters and the narrative agents of Lisa and Mike. Many more objects are shown in the virtual world 6 including three citizen objects, a weather simulation object, lobby, hallway and state room objects, and two backpack, boots, map and hat objects, each of which is managed by the server application SA in accordance with input from Mike and Lisa via their player objects O1, O2 and Mike and Lisa's narrative agents OA1, OA2, and the stories and narrative forms currently taking place in the virtual world 6.

In this regard, each of the player objects O1 and O2 respectively associated with Lisa and Mike may have associated PNAs, or either or both of objects O1 or O2 may not have PNAs associated with them. That is, Lisa and/or Mike may alternatively choose to be involved in the virtual world 6 without a PNA as described herein. In addition, each of the computer-controlled character objects O21 and O22 respectively associated with Rosencranz and Guildenstern may or may not have PNAs associated with them. A PNA associated with either of Rosencranz or Guildenstern may function just as a PNA associated with a user such as Lisa or Mike, except that computer input is substituted for user input. In addition, either of the computer-controlled characters of Rosencranz or

The server application SA instantiates objects from its object library OL. In the example of FIG. 8, character, player or user, room and agent objects are stored in the object library OL or the server application SA. The server application SA also saves the current state of any object (including those of users or players and automated characters) into a datastore when necessary or appropriate. A user interface, network interface and random access memory are also shown in FIG. 8.

Referring to FIG. 9b, a LAN-based multiple user network environment is shown for use of the personal narrative of the preferred embodiment. Multiple users U2-U5 having access to client computers C2-C5, respectively, are each logged onto the LAN via ethernet. In the LAN-

An example of WAN or large-scale network or internet-based use of the personal narrative of a preferred embodiment is illustrated at FIG. 9c, which is excerpted from US patent no. 5,897,622 as a general network structural example. A client computer 100 is shown connected to a server complex 102 including a gateway server 101, via connection over a network 104, which may be the internet or other large scale network. Other connections such as an IR link 107 and a satellite link 109 are shown.

A more detailed description of the form and function of a personal narrative agent in accord with the preferred embodiments is now set forth in the discussions that follow with references to the drawings. Referring first to FIG. 10, Lisa's PNA OA1, from the above example, is shown immersed within the virtual world 6, wherein Lisa's PNA interacts with objects and influences actions and movements of objects in the interests of Lisa's narrative experiences. FIG. 10 illustrates querying and

modification of world state by Lisa's PNA OA1 in accord with a preferred embodiment. Although not shown, many additional PNAs including, e.g., Mike's PNA OA2 from the above example, are also preferably interacting with and influencing object actions and movements in the simulated world 6.

The bidirectional arrows pointing to and from objects in the virtual world 6 and to and from Lisa's PNA OA1 indicate the role of Lisa's PNA OA1. Lisa's PNA OA1 can access detailed knowledge about the portion of the virtual world simulation 6 that is relevant to Lisa. As illustrated in Fig. 10, Lisa's PNA OA1 maintains a data about the environment including information relating to each of the player or user objects O1, O2, and citizen, character, room, weather and other objects in the virtual world 6 that may be relevant to one of more of Lisa's story experiences or stories. Lisa's PNA OA1 can cause events in the world in order to create new opportunities to advance Lisa's current stories or to follow new stories. For example, Lisa's PNA OA1 may query an object such as a map object M to determine whether the map may be used to advance a story involving Lisa, and if so, might cause the map to be blown along the ground across the path of Lisa's player object O1 to turn Lisa's attention to the map, or an item may fall out of a backpack object B, etc.

Referring to FIG. 11, narrative personalization for a user, e.g., Lisa, by a personal narrative agent, e.g., Lisa's PNA OA1, is illustrated. In accord with a preferred embodiment, Lisa's PNA OA1 maintains a detailed set of data regarding Lisa's interests, preferences and past actions, and uses that information in order to enhance the story experiences offered to Lisa. Similarly, other PNA's of other users maintain similar data with respect to those other users in a preferred embodiment. Alternative embodiments exist where no such information is gathered or maintained.

As shown in Fig. 11, Lisa's PNA OA1 watches Lisa's actions and/or asks Lisa questions to increase and/or update its information base with respect to Lisa. The information maintained by Lisa's PNA OA1 may be regarded as part of the relevant data maintained by Lisa's PNA OA1.

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In the case of initial instantiation at step S1, no previous scene exists, so the PNA starts from scratch by creating a new story at step S7. A detailed process for creating a new story is set forth at FIG. 17, discussed below. Once the new story is created at step S7, then possible scenes are determined at step S10.

In the case where a previous scene does exist, three possible courses of action exist, as shown, for the PNA in FIG. 13. A first course of action is taken when the user to which the PNA is uniquely assigned abandoned the last scene. In this first case, the PNA issues shutdown instructions for the previous scene at step S8. After issuance of the instructions, either an intended story is determined at step S9, wherein future plot possibilities are simulated, after which at step S10 possible

A second course of action may be taken when a previous scene exists and the user has branched to a different story. If the user branched away from the last scene at an opportunity for such a story transition placed there by the user's uniquely assigned PNA, then the story followed by the user will now become the primary story. Referring to FIG. 13, this exit or branching to a new story is analyzed at step S6 and the primary story is set at step S13 as the story to which the user chose to branch.

Whether a primary story has been set at step S13 by a user choosing to branch to that story from a previous story, or by a user choosing an offered story opportunity at step S11, or because the previous scene has been completed, the next step shown in FIG. 13 for the PNA is to query the primary story for scene options at step S14. If no options are found, the PNA returns to step S11 to offer further story

opportunities. Otherwise, scene options are assembled and the PNA analyzes the world state and player or user history and preferences at step S15. Supporting data such as was described above with reference to FIG. 11 is assembled and a next scene is selected at step S16. Once the next scene is selected, then the next scene is setup at step S3, as shown at FIG. 13 and the method continues with step S17 of FIG. 12 and the starting of the new scene.

Referring now to FIG. 14, a method for a PNA to set up a new scene in accord with a preferred embodiment is illustrated and described. Once the new scene is selected at step S16 (which is included within Next Scene Determined S2 in FIG. 14), setup is begun at step S17 by the PNA determining scene components and attributes. To setup a new scene, the PNA chooses specific people or objects to play the roles required or desired in the scene, plans the action and issues instructions to scene components. Some of these scene components and attributes may include the setting, roles of characters, citizens, objects and/or players or users, the mood, the pace, value transition possibilities, beat options and possible sequences (see FIGS. 16 and 18-19 and discussion thereof below relating to beats).

Each component is represented by an object in the environment, which might be a virtual world 6. The needs or desired options for a specific scene are included in its grammar, as specified by its narrative form. Available data sources for possible scene components include active stories, the virtual world 6, other PNAs, history and preference of the user to which the PNA is uniquely assigned, and the object library OL. If none of the options for required scene components are available, then another scene is selected in step S2 as mentioned above in discussion of FIG. 13.

However, if at least one option for each of the required scene components is available, then after these required and perhaps other optional scene components are selected, then a reservation request for the selected scene components is made by the PNA at step S18. If any

Once the scene plan is created at step S19, preparatory instructions are issued to scene components at step S20. Instructions to the scene components include the location of the scene, actions and goals for the possible beats of the scene, and actions and goals for the shutdown of the scene. These instructions are preferably issued repeatedly until acknowledged at step S20, or if scene component instruction is unsuccessful, then the method returns to step S17. Once the scene components are prepared, then the new scene is started at step S4, as in shown in FIGS. 12 and 15.

Referring to FIG. 16, once a new scene is started at step S4, the PNA triggers beats, or action/response sets, to move the scene forward at step S21. During each beat, some set of the scene components and

In a preferred embodiment, the story selector AS selects a narrative form, a few major characters and abstracted events from a datasource of personal narrative sources 14, and dynamically generates an outline plot

FIG. 18 illustrates a timeline for scene transition in accord with a preferred embodiment. The time series of FIG. 18 shows in more detail the possibility for simultaneous action of the PNA according to a preferred embodiment. As shown, a scene may be evolving according to the discussion above with reference to FIGS. 12 and 16 at step S5. Once an

exit event has been triggered, the PNA begins to determine and prepare the next scene at steps S2 and S3, respectively, while at the same time continuing to evolve the next scene at step S5. At a final beat of the scene being evolved at step S5, control is handed off to the new scene at step S4. The new scene is then evolved at step S5' as shown in FIG. 18. Alternative embodiments, where planning activity occurs following a previous scene, also exist and are fully compatible with the architecture of a preferred PNA.

FIG. 19 illustrates the anatomy of a narrative form in accord with a preferred embodiment. The narrative form's top level, a story grammar defines the progression of a story arc through all of its stages (see FIG. 20 below which summarizes the lifetime of the story state machine). Story grammar generates individual stories and defines a sequence of potential acts, e.g., introduction, complication, climax, resolution, etc. The story may be identified by its theme, genre, sequence of potential acts, possible transitions to other narrative forms, etc.

At the second level, act grammar generates individual acts and defines a sequence of potential scenes. Stories comprise acts, each of which has its own grammar comprising scenes. Acts include required and optional value transitions, and scene options and possible sequences.

At the third level, scene grammar generates individual scenes and defines a sequence of potential beats. Scenes definitions include players and characters, the setting and its characteristics, value transition possibilities, beat options and possible sequences, mood, pace, etc. Scenes have a grammar as well, describing the beats, or action/reaction possibilities that drive a scene, and their pacing and abstracted content.

At the fourth level, beat grammar generates individual beats and defines a sequence of potential shots. Beats describe characters and objects, potential interactions and next beats, actions, timing, etc. The sequence of shots are the dramatic unit that drives the presentation of a story to the player or user second by second. At the fifth level, shot

If instantiation of the new story succeeds, then transition to the new story occurs at step S35. If the transition fails, then the consequences are resolved at step S34 and processed, and the story is destroyed at step S31. If the transition succeeds, then the initial story is destroyed at step S31 without resolving consequences at step S34. If a story that is evolving at step S32 is abandoned, then consequences of

The PNA uniquely assigned to each user can use several techniques to manage the progression of stories for its user. Some of these techniques include: (1) narrative forms that incorporate simple branching (see three-pronged branching labeled (A) in FIG. 21); (2) auto-generation of new story arcs when players or users choose to split off from a defined narrative form (see dashed line arc in FIG. 21); (3) natural continuation of one narrative form into another, upon completion of the first (as a decision aid for the story selector) (see transition marked by a triangular symbol in Fig. 21); (4) scripted transition possibilities, where human authors have defined particular value transitions within a story that can morph it into a different narrative form (see transition marked by a rectangular symbol in FIG. 21); (5) autonomous transition possibilities, wherein the PNA uses plan recognition to determine that a player or user intends to pursue a different narrative form, whereby upon recognition, the PNA can change the story into that narrative form on the fly (see transition marked by circular symbol in FIG. 21) ; (6) modular (generalized)

transition possibilities, whereby narrative form definitions include the logical parameters by which other narrative forms can relate to them, without necessarily referring or linking to those other narrative forms specifically (see transition marked at square or diamond symbol in FIG. 21); and (7) larger narrative arcs, whereby story arcs can form episodes of a much larger story (see transitions marked at oval symbol in FIG.21).

FIG. 22 illustrates sharing of stories by multiple players or users in accord with a preferred embodiment. Users can play roles in one another's stories in accord with the preferred embodiment. FIG. 22 shows story arcs representing Sally's and Fred's stories. Shared scenes are marked by circles and shared stories are denoted with dashed arcs in FIG. 22. In some cases (see 1 in FIG. 22), each of Sally and Fred plays a role in the other's story. In other cases, this type of interaction can lead the users to share an entire story (see 2 in FIG. 22). This cross-user interaction need not be limited to two people, but could involve many (see 3 in FIG. 22). In all cases, each user's uniquely assigned PNA negotiates with the other users' PNAs to generate the combined scenes and stories, as discussed above with reference to FIG. 6.

In short, the preferred embodiments set forth above describe a system for providing interactive narrative wherein multiple stories may be simultaneously managed by a personal narrative agent uniquely assigned to a single user, wherein each of those stories may progress to a narrative conclusion either independent of or inter-related with each other. A system has also been described above wherein multiple users each have a uniquely assigned personal narrative agent which manages the story experiences of the user to which it is assigned. Each personal narrative agent maintains data relating to its user and interacts with the environment and objects and characters therein, as well as with other narrative agents assigned to other users, to further the narrative progression of the stories involving the user. Each user in a multiple user environment thus may pursue their own individual stories independently

from the stories of the other users, whether or not the user chooses to interact with any particular other user.

While exemplary drawings and specific embodiments of the present invention have been described and illustrated, it is to be understood that that the scope of the present invention is not to be limited to the particular embodiments discussed. Thus, the embodiments shall be regarded as illustrative rather than restrictive, and it should be understood that variations may be made in those embodiments by workers skilled in the arts without departing from the scope of the present invention as set forth in the claims that follow, and equivalents thereof.

In addition, in the method claims that follow, the steps have been ordered in selected typographical sequences. However, the sequences have been selected and so ordered for typographical convenience and are not intended to imply any particular order for performing the steps, except for those claims wherein a particular ordering of steps is expressly set forth or understood by one of ordinary skill in the art as being necessary.

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